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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : C11D 1/52, 3/37	A1	(11) International Publication Number: WO 99/18177 (43) International Publication Date: 15 April 1999 (15.04.99)
(21) International Application Number: PCT/GB98/02987 (22) International Filing Date: 7 October 1998 (07.10.98) (30) Priority Data: 97402358.2 7 October 1997 (07.10.97) EP (71) Applicant (for all designated States except MN US): RECKITT & COLMAN FRANCE [FR/FR]; 15, rue Ampère, Boîte postale 83, F-91301 Massy Cedex (FR). (71) Applicant (for MN only): RECKITT & COLMAN PRODUCTS LIMITED [GB/GB]; 67 Alma Road, Windsor, Berkshire SL4 3HD (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): JOETZJER, Pascale [FR/FR]; 5, rue Cornu, F-27400 Louviers (FR). FAURE, Serge [FR/FR]; 90, rue de la Paix, F-28600 Luisant (FR). (74) Agents: DICKSON, Elizabeth, Anne et al.; Reckitt & Colman plc, Group Patents Dept., Dansom Lane, Hull HU8 7DS (GB).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>
(54) Title: DETERGENT COMPOSITION (57) Abstract A laundry detergent composition for washing delicate fabrics comprising one or more anionic, nonionic or amphoteric surfactants; a natural and/or synthetic ceramide; a silicone emulsion and, optionally, other detergent ingredients.		

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DETERGENT COMPOSITION

This invention relates to a laundry detergent composition which is suitable for laundering fine fabric materials such as wool, silk, nylon,
5 polyester and the like under relatively mild washing conditions.

Laundry detergent compositions generally employ anionic surfactants as the primary
10 detergent-active compounds, such as alkyl benzene sulphonates, fatty alcohol sulphates or alkyl glycol ether sulphates. However, it has been found that a number of anionic surfactants damage the fibre structure of sensitive fabrics upon repeated washing. Fine fabric wash formulations
15 tend to contain a blend of anionic surfactants with non-ionic or amphoteric surfactants. The non-ionic surfactants are intended to increase detergency. However, when sensitive woollen fabrics are washed with non-ionics, the fabrics
20 tend to feel comparatively hard and brittle. These effects can be intensified with machine washing. An addition of softening amphoteric surfactants does not completely counteract the loss of feel and, although amphoteric surfactants act as fibre-softening agents, some anionic and
25 non-ionic surfactants reduce the softening effect of the amphoteric surfactants. Also, most known softening agents which are incorporated into detergents are detrimental to cleaning performance.

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There is therefore a need for a fine fibre wash formulation which can be used to wash delicate fabrics such as woven or knitted woollen fabrics and silk, which gives a good cleaning performance without having a detrimental effect on the
5 properties of the fabric, and which ensures that the treated fabric has a soft feel.

In accordance with the present invention, there is provided a laundry detergent composition for
10 washing delicate fabrics comprising:

- a) one or more anionic, non-ionic or amphoteric surfactants or a mixture of two or more thereof;
- b) a natural and/or synthetic ceramide;
- 15 c) a silicone; and
- d) optionally other detergent ingredients.

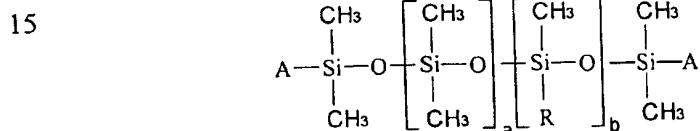
Preferably, the detergent composition comprises:

- 20 a) 2 to 60 wt % of one or more anionic, non-ionic or amphoteric surfactants or a mixture thereof;
- b) from 0.001 to 5 wt % of one or more
25 ceramides;
- c) from 0.05 to 5 wt % of a polydimethylsiloxane; and
- 30 d) optionally other detergent ingredients to 100 wt %.

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It has been found that the use in the present composition of a silicone and a ceramide in combination provides a detergent with, simultaneously, a softening effect and an overall efficient cleaning performance.

Preferably, the silicone is a silicone fluid, more preferably a silicone emulsion, and most preferably a silicone micro-emulsion. Examples of suitable silicones are polyalkyl or polyarylsilicones. Particularly preferred silicones are polydimethylsiloxanes, with organic groups incorporated into the basic silicone backbone, having the following structure:



wherein R is an amino, polyether, epoxy, hydroxyl, polyether/amino, polyether/epoxy or cyclohexyl functional group; A may be any group suitable for ending the silicone chains, for example a hydrogen, methyl or hydroxyl group; and a and b are integers, preferably between 7 and 5000.

Examples of suitable silicones are those marketed under the trade names DC 225 (produced

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by Dow Corning Corporation) and Magnasoft EM 410 (produced by Witco).

5 The concentration of silicone in the compositions of the invention suitably lies in the range from 0.05 to 5 wt %, preferably 0.1 to 2 wt % and most preferably the silicone concentration is about 0.5 wt %.

10 The ceramide present in the composition of the present invention may be a natural ceramide or a synthetic ceramide, for example an N-acylsphinganine or a derivative thereof. The amide-linked fatty acids are generally characterised by a C₁₆ to C₂₆, C₃₀/w-OH or C₃₂/w-OH chain. The long chain amine may be sphingosine
15 or sphinganine or phytosphingosine.

Particularly preferred ceramides are Bis (N-hydroxyethyl cetyl) Malanamide which is marketed under the trade name Questamide H and
20 produced by Quest (this is synthetic "ceramide 2", with ceramide 2 being naturally found in hair); Palmitado-serinate de myristyl which is marketed under the trade name ceramide A2 and produced by Sederma; Palmitadohexadecanediol which is marketed under the trade name Ceramide
25 II and produced by Quest and a glycosphingolipid marketed under the trade name ceramide PG5 and produced by Seporga.

30 The composition of the present invention may contain only one ceramide, or, alternatively, two or more different ceramides may be present.

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The concentration of ceramide in the compositions of the invention suitably lies in the range from 0.001 to 5 wt %, preferably 0.001 to 2 wt % and most preferably 0.01 to 1 wt %.

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The desired effects of the present invention are attained by the combined actions of the silicone emulsion and the ceramide in such a detergent formulation.

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The composition of the present invention further includes detergent-active compounds. Many suitable detergent-active compounds are available and are fully described in the literature. The total amount of surfactant present in the composition of the present invention ranges from 2 to 60 wt % by weight of the total fine fabric detergent composition, preferably 5 to 40 wt %, and most preferably 10 to 20 wt %.

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The choice of anionic surfactant is not limited and any anionic surfactant suitable for use in a laundry composition may be used. Examples of suitable anionic surfactants are alkylbenzene sulphonates, particularly linear alkylbenzene sulphonates having an alkyl chain length of C₈ - C₁₅; primary and secondary alkyl sulphates, particularly C₈ - C₁₅ primary alkyl sulphates; alkyl ether sulphates; olefin sulphonates; alkyl xylene sulphonates; dialkyl sulposuccinates and fatty acid ester

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sulphonates. Sodium salts are generally preferred.

5 Particularly preferred anionic surfactants are sodium lauryl ether sulphate, which is available under the trade name EMPICOL ESC3 from Albright & Wilson; sodium lauryl sulphate, which is available under the trade name EMPICOL LX from Albright & Wilson; α -olefine sulphonate, which is available under the trade name RHODACAL A 246 L
10 from Rhône-Poulenc and disodium lauryl sulphonosuccinate, which is available under the trade name REWOPOL 5B F12 from Witco.

15 The anionic surfactants are desirably present in amounts of 2 to 30 wt %, preferably 5 to 20 wt %, and most suitably the anionic surfactant concentration is about 10 wt %.

20 The choice of non-ionic surfactant is also not limited and any non-ionic surfactant suitable for use in a laundry composition may be used. Examples of suitable non-ionic surfactants are primary and secondary alcohol ethoxylates, especially the $C_8 - C_{20}$ aliphatic alcohols ethoxylated with an average of from 1 to 20 moles of ethylene oxide per mole of alcohol, and most
25 particularly the $C_{10} - C_{15}$ primary and secondary aliphatic alcohols ethoxylated with an average of from 1 to 10 moles of ethylene oxide per mole of alcohol. Non-ethoxylated non-ionic surfactants include alkyl polyglycosides, glycerol

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monoethers, alkanol amides and polyhydroxyamides (glucamide).

Particularly preferred non-ionic surfactants are Coceth-6 (PEG ether of coconut alcohol);
5 Coceth-10 (PEG ether of coconut alcohol);
Laureth-6 (PEG ether of lauryl alcohol);
Lauramide DEA, which is available under the trade name EMPILAN 26224 from Albright & Wilson; and
lauryl polyglucoside, which is available under
10 the trade name PLANTEREN 1200CS/UP from Henkel.

The non-ionic surfactants are desirably present in amount of 0 to 20 wt %, preferably 0.5 to 10 wt %, and most suitably about 1 to 2 wt %.

15 Particularly preferred amphoteric surfactants are cocoamidopropylbetaine, such as that available under the trade name EMPIGEN from Albright & Wilson and amine oxides, such as lauramine oxide, which is available under the
20 trade name TEGAMINE OXIDE W from Goldsch.

The amphoteric surfactants are desirably present in amounts of 0.5 to 20 wt % and preferably 0.5 to 10 wt %.

25 In addition to the above specified ingredients and water, the compositions of the present invention can optionally contain relatively minor amounts of the usual types of non-surfactant auxiliary ingredients as are commonly employed in
30 conventional laundry detergents, for example inorganic salts such as sodium carbonate, sodium

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5 sulphate or sodium silicate (where the composition is a powder); anti-redeposition agents such as cellulosic polymers; preservatives; optical brighteners; pearlescing agents; colourants; viscosifying agents such as sodium chloride and pH regulators such as citric acid. This list is not intended to be exhaustive.

10 Detergent compositions of the invention may be of any suitable form, for example powders or granules, liquids or gels. The manner in which the detergent compositions are prepared or formulated is not particularly critical and such may be prepared by methods well known to those skilled in the art.

15 The detergent compositions of the present invention are especially well suited and beneficial for the laundering under relatively mild washing conditions (e.g. mild or gentle machine agitation or hand washing and at low or cold wash water temperature) of fine fabric materials such as knitted fabrics of wool and silk, nylon and polyester. In addition to an excellent washing result, these fabrics do not become hard, but instead retain their natural softness, not only with hand washing but also with machine washing.

25 In order that the invention may be more fully understood, it will now be described with reference to the following examples, in which all percentages are on a weight basis.

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Example 1

A fine fabric wash detergent composition was prepared from the following ingredients:

5	Component	wt%	Nature	Trade name
	α -olefine Sulphonate	5.2	Anionic surfactant	RHODACAL A 246 L (RP)
10	Sodium Lauryl Sulphate	8.3	Anionic surfactant	EMPICOL LX (A&W)
	Lauryl Polyglucoside	1.0	Non-ionic Surfactant	PLANTEREN 1200CS/UP (HENKEL)
	Lauramide DEA	0.75	Non-ionic Surfactant	EMIPLAN 26224 (A&W)
15	Cocoamidopropyl betaine	2.5	Amphoteric surfactant	EMPIGEN (A&W)
	Amino-functional silicone emulsion	1.1	silicone	MAGNASOFT Em. 410 (Witco)
20	Palmitadohexadenediol	0.9	Ceramide	CERAMIDES II (Quest)
	Citric Acid	0.05	pH regulator	
	Preservative	0.05		
25	Dye	0.01		
	Fragrance	0.20		
	Deionised Water	qsp 100		

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Example 2

A fine fabric wash detergent composition was prepared from the following ingredients:

5		Component	wt%	Nature	Trade name
		Sodium Lauryl Ether Sulphate	3.5	Anionic surfactant	EMPICOL ESC3 (A&W)
10		Sodium Lauryl Sulphate	4.3	Anionic surfactant	EMPICOL LX (A&W)
		Coceth-6	1.6	Non-ionic surfactant	REWOPAL LA 6 (Witco)
15		Lauramide DEA	0.5	Non-ionic surfactant	EMIPLAN 26224 (A&W)
		Lauramine oxide	2.5	Amphoteric surfactant	TEGAMINE OXIDE W (Goldsch.)
20		Amino-functional silicone emulsion	0.6	silicone	MAGNASOFT Em. 410 (Witco)
		Bishydroxyethyl biscetyl malonamide	0.5	Ceramide	QUESTAMIDE H (Quest)
		Citric Acid	0.05	pH regulator	
25		Sodium chloride	2.0		
		Preservative	0.05		
30		Dye	0.01		

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Fragrance	0.2		
Deionised Water	qsp 100		

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Example 3

A fine fabric wash detergent composition was prepared from the following ingredients:

10	Component	wt%	Nature	Trade name
	Disodium Lauryl sulphosuccinate	4.2	Anionic surfactant	REWOPOL SB F12 (Witco)
	Sodium Lauryl Sulphate	6.6	Anionic surfactant	EMPICOL LX (A&W)
15	Coceth-10	1.4	Non-ionic surfactant	REWOPAL LA 10 (Witco)
	Cocamidopropyl betaine	2.9	Amphoteric surfactant	EMPIGEN (A&W)
20	Cyclohexylamino-functional silicone emulsion	1.5	silicone	FINISH CT110 (Wacker)
	Palmitadohexadenediol	1.0	Ceramide	CERAMIDES II (Quest)
25	Palmitamido serinate de myristyl	0.5	Ceramide	CERAMIDE A2 (Seporga)
	Citric Acid	0.05	pH regulator	
	Preservative	0.05		

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Dye	0.01		
Fragrance	0.2		
Deionised Water	qsp 100		

Example 4

A fine fabric wash detergent composition was prepared from the following ingredients:

Component	wt%	Nature	Trade name
Sodium Alkyl Benzene sulphonate	8.2	Anionic surfactant	REWOPOL SB F12 (Witco)
Sodium Lauryl Ether Sulphate	8.6	Anionic surfactant	EMPICOL LX (A&W)
Lauryl Polyglucoside	2.6	Non-ionic Surfactant	PLANTEREN 1200CS UP (HENKEL)
Lauramide DEA	0.75	Non-ionic Surfactant	EMIPLAN 26224 (A&W)
Lauramine oxide	2.3	Amphoteric surfactant	TEGAMINE OXIDE W (Goldsch.)
Amino-functional silicone emulsion	4.5	silicone	DC 225 (Witco)

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5	Bishydroxyethyl biscetyl Malonamide	2.25	Ceramide	QUESTAMIDE H (Quest)
	Glycosphingolipids	2.5	Ceramide	CERAMIDE PG5 (Seporga)
	Citric Acid	0.05	pH regulator	
	Preservative	0.05		
	Dye	0.01		
10	Fragrance	0.2		
	Deionised Water	qsp 100		

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Example 5

A fine fabric wash detergent composition was prepared from the following ingredients:

20	Component	wt%	Nature	Trade name
	Sodium Alkyl Benzene sulphonate	15.5	Anionic surfactant	REWOPOL SB F12 (Witco)
25	Coceth-6	5.0	Non-ionic surfactant	REWOPAL LA 6 (Witco)
	Sodium Cocoate	3.0	Soap	NORFOX COCO POWDER (Norman)
30	Sodium silicoaluminate (Zeolite)	23.0	Builder	WESSALITH S (Degussa)

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5	Sodium silicate	3.0	Builder	
	Sodium carbonate	5.0	Builder	
	Sodium bicarbonate	15.0	Builder	
	Sodium sulphate	15.0	Filler	
10	Cyclohexylamino-functional silicone emulsion	1.5	Silicone	FINISH CT110 (Wacker)
	Glycosphingolipids	2.5	Ceramide	CERAMIDE PG5 (Seporga)
15	Sodium citrate	10.0		
	Fragrance	0.2		
	Water	qsp 100		

20 In order to demonstrate the desired effects of the present invention, the following test was performed.

25 Wool fibres of diameter 0.1 - 0.14 mm were evaluated for elasticity using a Rheometrics RSA 2 Solids analyser fitted with a monofilament geometry to give a sample length of 24 mm. The test used was a steady strain rate test using a constant strain rate of 0.0001 s^{-1} with the temperature controlled at 20°C . This allowed measurement of Youngs modulus for a strain

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between 2 and 3% in the elastic region of the wool fibre which is equal to the elastic modulus G^1 . Values of G^1 are given in the table below:

	<u>Elasticity.</u>
5 Wool without treatment	$9.66 \times 10^7 \text{ Pa/\%}$
Wool washed 3 times with water only	$3.23 \times 10^7 \text{ Pa/\%}$
Wool washed 3 times with detergent formulation containing a ceramide	$3.73 \times 10^7 \text{ Pa/\%}$
Wool washed 3 times with detergent formulation containing a ceramide plus a	$6.79 \times 10^7 \text{ Pa/\%}$
10 silicone emulsion	

From the results it can be seen that a formulation containing a ceramide and a silicone emulsion significantly increased the elasticity of the wool fibre compared to washing in water alone or with a formulation containing ceramide alone.

Furthermore, further tests carried out on different fabrics showed a noticeable improvement of the softness of each fabric when the fabric was washed in a detergent formulation containing ceramide and silicone emulsion compared to washing in water alone or in a standard detergent formulation which did not contain a silicone derivative or a ceramide. Derived from cosmetics technology, it would appear that the ceramides penetrate into the fibres to restore both their strength and volume. In addition, the silicone appears to impart a softness to all types of textiles.

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For example, the following test was performed to demonstrate the improved softness of fabrics washed in a detergent formulation in accordance with the present invention.

5 Four groups of wool or wool/acrylic fabrics were hand-washed in:

Formulation 1: the formulation in accordance with Example 3, as described previously;

10 Formulation 2: the formulation of Example 3 minus any ceramide or silicone emulsion;

Formulation 3: the formulation in accordance with Example 5, as described previously; and

15 Formulation 4: the formulation of Example 5 minus any ceramide or silicone emulsion.

20 The fabrics were hand-washed with 35 ml of the detergent diluted in 5 litres of water (middle hardness water) at 30°C and then rinsed twice in 5 litres of cold water.

25 After 3 washes, panellists were asked to compare the softness of the washed fabrics. The figures given in the table below indicate the preceived softness of the fabrics as compared to the softness of the fabrics prior to washing.

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Fabric	Formulation 1 vs Formulation 2		Formulation 3 vs Formulation 4	
	Formulation 1	Formulation 2	Formulation 3	Formulation 4
Wool	90%	10%	75%	25%
Wool/Acrylic	75%	25%	80%	20%

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CLAIMS

1. A laundry detergent composition for washing delicate fabrics comprising:
 - 5 a) one or more anionic, non-ionic or amphoteric surfactants or a mixture of two or more thereof;
 - b) a natural and/or synthetic ceramide;
 - 10 c) a silicone; and
 - d) optionally other detergent ingredients.
- 15 2. A detergent composition according to Claim 1, wherein the silicone is an amino-functional silicone.
- 20 3. A detergent composition according to Claim 2, wherein the silicone is a microemulsion of a polydimethylsiloxane.
- 25 4. A detergent composition according to claim 1, comprising:
 - a) 2 to 60 wt % of one or more anionic, non-ionic or amphoteric surfactants or a mixture of two or more thereof;
 - b) from 0.001 to 5 wt % of one or more ceramides;
 - 30 c) from 0.05 to 5 wt % of a polydimethylsiloxane; and

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- d) optionally other detergent ingredients to 100 wt %.
- 5 5. A detergent composition according to any of claims 1 to 4, wherein the ceramide is selected from Bis (N-hydroxyethyl cetyl) Malonamide; Palmitadohexadecanediol; Palmitado-serinate de myristyl and glycosphingolipids.
- 10 6. A process for laundering fabric materials comprising the steps of immersing the material, with at least mild agitation, in a detergent composition comprising:
- 15 a) one or more anionic, nonionic or amphoteric surfactants or a mixture of two or more thereof;
- b) a natural and/or synthetic ceramide;
- 20 c) a silicone; and
- d) optionally other detergent ingredients.
- 25 7. A process for laundering fabric materials comprising the steps of immersing the material, with at least mild agitation, in a detergent composition comprising:
- a) 2 to 60 wt % of one or more anionic, non-ionic or amphoteric surfactants or a mixture of two or more thereof.
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- b) from 0.001 to 5 % of one or more ceramides;
 - c) from 0.05 to 5 wt % of an aminopolydimethyl
siloxane; and
 - 5 d) optionally other detergent ingredients to
100 wt %.
8. A process according to Claim 6 or 7, wherein
the fabric material laundered thereby is a
10 silk, nylon, polyester or wool fabric
material.

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INTERNATIONAL SEARCH REPORT

Inter national Application No

PCT/GB 98/02987

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 C11D1/52 C11D3/37

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 C11D A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	"PSEUDOCERAMIDES IN CONSUMER PRODUCTS" RESEARCH DISCLOSURE, no. 394, February 1997, page 96 XP000698514 see the whole document ---	1,6,8
A	DATABASE WPI Section Ch, Week 9013 Derwent Publications Ltd., London, GB; Class D21, AN 90-096016 XP002089065 & JP 02 048520 A (POLA KAESI KOGYO KK) , 19 February 1990 see abstract ---	1,4,6-8
A	US 4 639 321 A (BARRAT CHRISTIAN R ET AL) 27 January 1987 see claims 1,2; example 1 ---	1,2,4, 6-8
-/-		

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

5 January 1999

Date of mailing of the international search report

15/01/1999

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INTERNATIONAL SEARCH REPORT

Inter nal Application No

PCT/GB 98/02987

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>US 5 075 403 A (KIRK JAMES R) 24 December 1991 see column 1, line 55 - line 60; claim 1; example 8</p> <p style="text-align: center;">-----</p>	1-3,6,8

INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No

PCT/GB 98/02987

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4639321 A	27-01-1987	NONE	
US 5075403 A	24-12-1991	FR 2648821 A EP 0404698 A JP 3095228 A US 5147578 A	28-12-1990 27-12-1990 19-04-1991 15-09-1992